10. Palouse Prairie Section

v. 2015-12-29

Section Description

The Palouse Prairie Section, part of the Columbia Plateau Ecoregion, is located along the western border of northern Idaho, extending west into Washington (Fig. 10.1, Fig. 10.2). This section is characterized by dissected loess-covered basalt plains, undulating plateaus, and river breaks. Elevation ranges from 220 to 1700 m (722 to 5577 ft). Soils are generally deep, loamy to silty, and have formed in loess, alluvium, or glacial outwash. The lower reaches and confluence of the Snake and Clearwater rivers are major waterbodies. Climate is maritime influenced. Precipitation ranges from 25 to 76 cm (10 to 30 in) annually, falling primarily during the fall, winter, and spring, and winter precipitation falls mostly as snow. Summers are relatively dry. Average annual temperature ranges from 7 to 12 °C (45 to 54 °F). The growing season varies with elevation and lasts 100 to 170 days.

Palouse Prairie grassland remnant on Gormsen Butte, south of Moscow, Idaho with cropland surrounding © 2008 Janice Hill

Population centers within the Idaho portion of the section are Lewiston and Moscow, and small agricultural communities are dispersed throughout. Outdoor recreational opportunities include hunting, angling, hiking, biking, and wildlife viewing. The largest Idaho Department of Fish and Game Wildlife Management Area (WMA) in Idaho, Craig Mountain WMA, is partially located in this section.

The deep and highly-productive soils of the Palouse Prairie have made dryland farming the primary land use in this section, with most farming operations occurring on private land. In addition, timber harvest has been another important land use and private and corporate timber companies are responsible for most of the logging operations within this section.

The rural rolling hills of farmland dominate the Palouse Prairie Section. Scattered among the farmland lie patches of some of the last remaining Palouse Prairie grasslands in the world. Palouse Prairie grasslands are characterized by a mixture of perennial bunchgrasses, forbs, and

low shrubs with a particularly high cover and diversity of forbs. Forb cover is commonly higher than grass cover. Dominant native bunchgrasses include Idaho fescue (*Festuca idahoensis* Elmer), bluebunch wheatgrass (*Pseudoroegneria spicata* [Pursh] Á. Löve), and prairie Junegrass (*Koeleria macrantha* [Ledeb.] Schult.). However, nonnative species have spread to many of the remaining Palouse Prairie grasslands. These include such aggressive weeds as North Africa grass (syn. ventenata; *Ventenata dubia* [Leers] Coss.), tall oatgrass (*Arrhenatherum elatius* [L.] P. Beauv. ex J. Presl & C. Presl), and rush skeletonweed (*Chondrilla juncea* L.). Palouse Prairie grasslands are home to such grassland-reliant species as the Giant Palouse Earthworm (*Driloleirus americanus*), Short-eared Owl (*Asio flammeus*), and Common Nighthawk (*Chordeiles minor*). Since many of these Palouse Prairie grassland remnants are small remnants in a fragmented landscape, and privately owned, management and conservation of these remnants remains a challenge.

Below the undulating topography of the Palouse, tributaries to the Clearwater River have cut steep gorges into the plateau. Slopes support the same bunchgrasses and the vegetation in general is similar to that of the Palouse Prairie grasslands, however slopes are steeper, soils shallower and often more well drained, and aspects more severe. These grasslands have traditionally been considered "canyon grasslands." Along streams and rivers, canyon grasslands extend beyond the riparian areas often transitioning into mixed-conifer forest as elevation increases. The treeless terrain of canyon grasslands provides important wildlife habitat for species such as Short-eared Owl and Common Nighthawk. Soils in the canyon grasslands are shallower than the deep loessial soils found in Palouse Prairie grasslands. Canyon grasslands are also drier than the Palouse Prairie grasslands. Much of the canyon grasslands in this section are grazed by livestock as most are privately owned. Some canyon grasslands remain intact and in good condition, but much of this habitat has been invaded by nonnative plants such as cheatgrass (*Bromus tectorum* L.) and yellow star-thistle (*Centaurea solstitialis* L.).

Currently, forests within the Palouse Prairie Section are a mixture of conifer species and are mostly dominated by Douglas-fir (*Pseudotsuga menziesii* [Mirb.] Franco) and grand fir (*Abies grandis* [Douglas ex D. Don] Lindl.). Western white pine (*Pinus monticola*) was historically more common but blister rust, fire suppression, and timber harvest have vastly reduced the distribution of this species. Ponderosa pine (*Pinus ponderosa*) was also likely more abundant in these forests prior to fire suppression and timber harvesting. Several wildlife species are reliant on this habitat including Fisher (*Pekania pennanti*) and many bird species such as Great Gray Owl (*Strix nebulosa*), Lewis's Woodpecker (*Melanerpes lewis*), White-headed Woodpecker (*Picoides albolarvatus*), and Olive-sided Flycatcher (*Contopus cooperi*).

Similar to Palouse Prairie grasslands, the development of agricultural lands has altered much of the wetland and riverine habitat within the Palouse Prairie Section. Many wetlands, meadows, and riparian areas have been drained and converted to cropland, and as a result the water table has dropped allowing reed canarygrass (*Phalaris arundinacea* L.) to invade these habitats (Servheen et al. 2002). The remaining aquatic habitats are important to many terrestrial and aquatic species. Western Toad (*Anaxyrus boreas*) and Great Gray Owl depend on wetland habitats. Several anadromous fish including Pacific Lamprey (*Entosphenus tridentatus*), Steelhead (*Oncorhynchus mykiss*), and Chinook Salmon (*O. tshawytscha*) inhabit the rivers and streams within the Clearwater Basin. There are many other fish and wildlife species that use

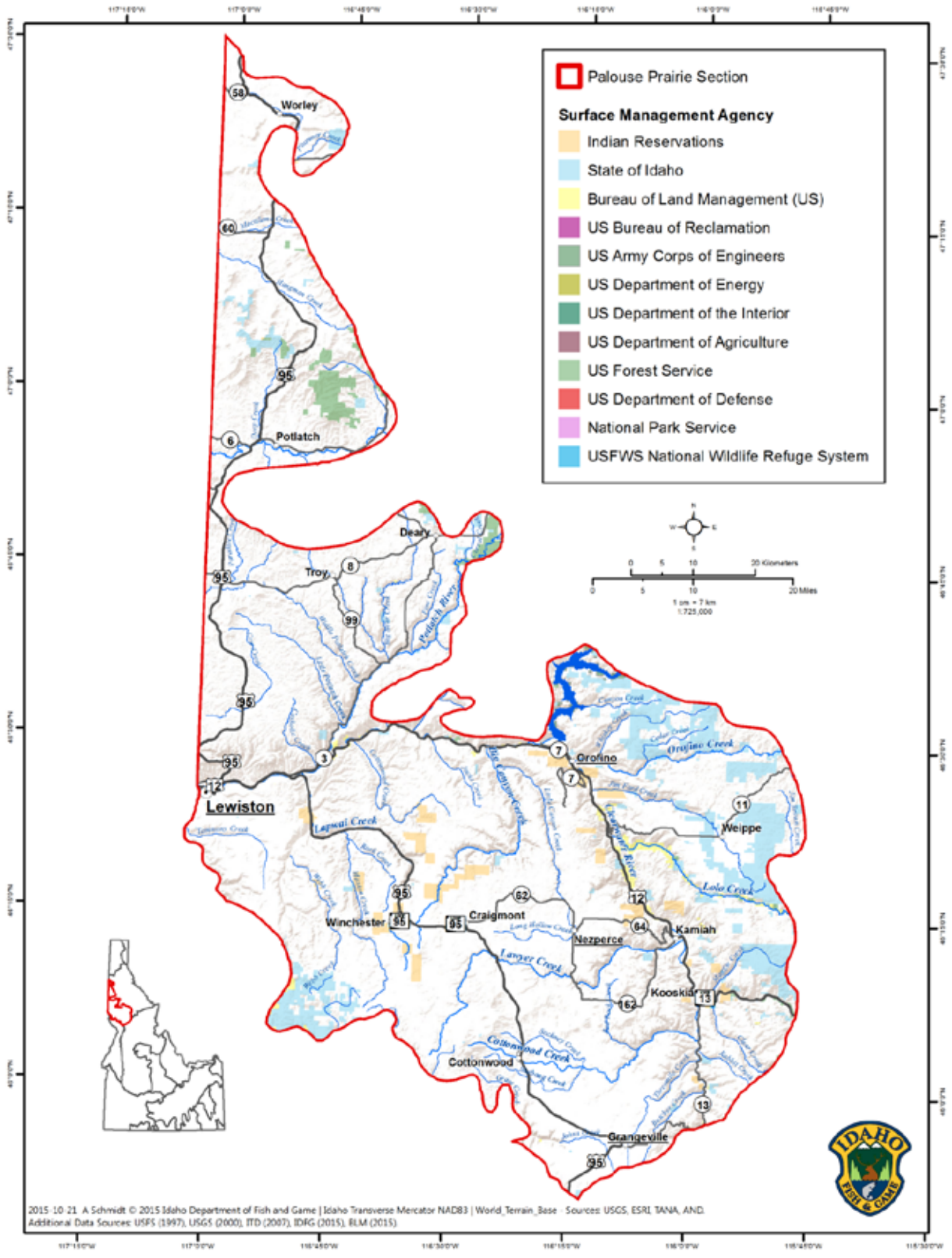

Fig. 10.1 Map of Palouse Prairie surface management

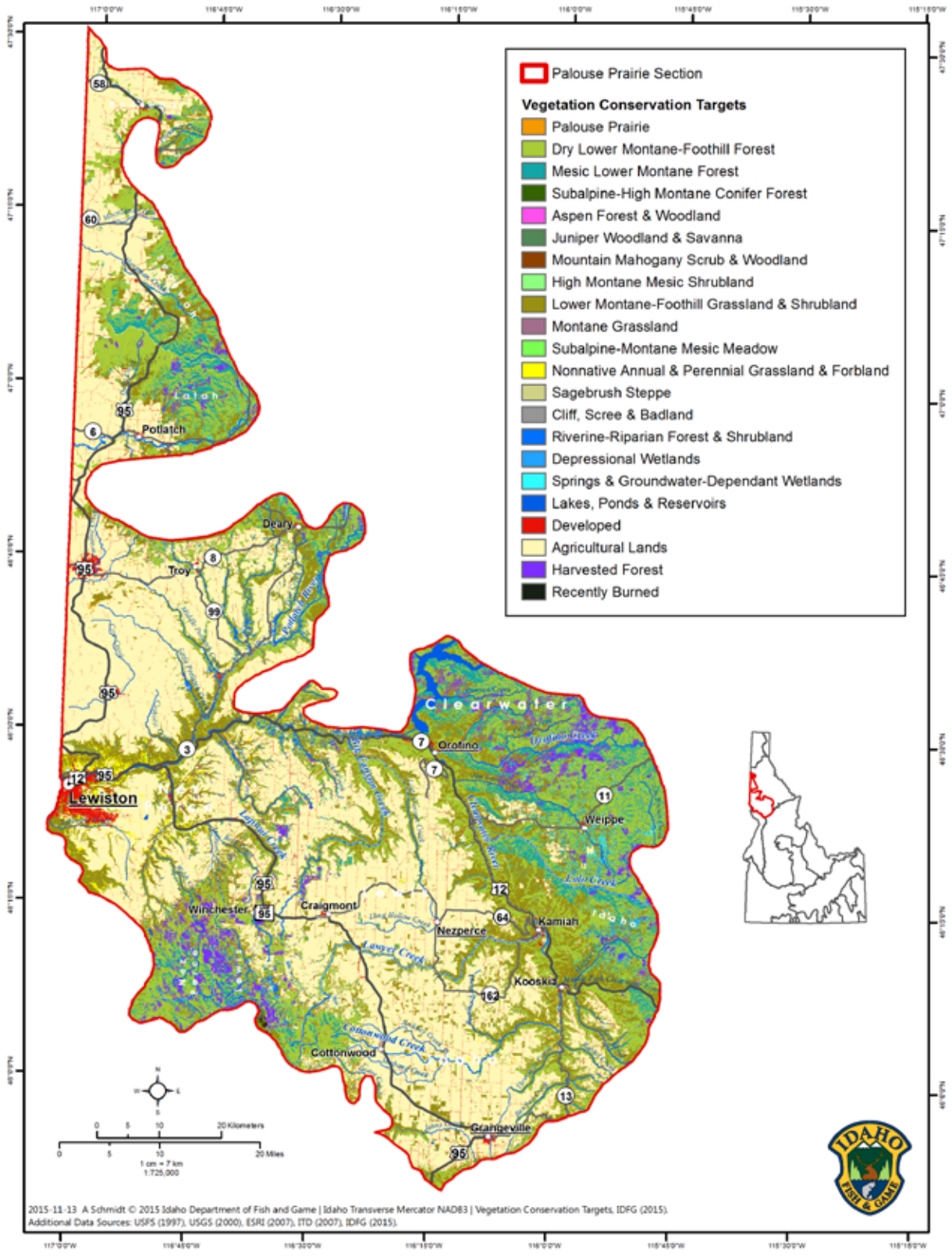

Fig. 10.2 Map of Palouse Prairie vegetation conservation targets

riparian areas and wetlands since resources such as water, food and cover are primarily available in these habitats.

Conservation Targets in the Palouse Prairie

We selected 6 habitat targets (3 upland, 3 aquatic) that represent the major ecosystems in the Palouse Prairie as shown in Table 10.1. Each of these systems provides habitat for key Species of Greatest Conservation Need (SGCN), i.e., "nested targets" (Table 10.2) associated with each target. All SGCN management programs in the Palouse Prairie have a nexus with habitat management programs. We provide a high-level summary of current viability status for each target. Conservation of the habitat targets listed below should conserve most of the nested species within them.

Table 10.1 At-a-glance table of conservation targets in the Palouse Prairie

Target	Target description	Target viability	Nested targets (SGCN)	
Dry Lower Montane–Foothill Forest	Mostly dominated by Douglas-fir and grand fir. Adjoins canyon grasslands, Palouse Prairie grasslands, or the boundary of the Bitterroot Mountains ecological section.	*Poor to Good.* Variable condition depending on past management and landownership. Largely modified and fragmented by timber harvest, roads, fire suppression, shorter timber rotations reducing abundance of late-seral forests, snags, and coarse woody debris.	*Tier 2* *Tier 3*	Lewis's Woodpecker Fisher Great Gray Owl Olive-sided Flycatcher White-headed Woodpecker
Lower Montane–Foothill Grassland & Shrubland	Occurring within river breaks and steep canyons. Characterized by a mixture of bunchgrasses and forbs with shrubs scattered throughout. Floristically similar to Palouse Prairie grasslands but are generally warmer and drier and have shallower soils.	*Fair.* Invasive weeds and improper grazing have degraded the habitat.	*Tier 3*	Short-eared Owl Grasshopper Sparrow Common Nighthawk A Miner Bee (*Perdita salicis euxantha*) A Miner Bee (*Andrena aculeata*) Hunt's Bumble Bee Monarch Morrison Bumble Bee Suckley Cuckoo Bumble Bee Western Bumble Bee Yellow Bumble Bee Mission Creek Oregonian
Palouse Prairie Grasslands	Usually found on uncultivated ridges surrounded by cropland. Comprised of a mixture of perennial bunchgrasses, forbs, and low shrubs. The north slopes tend to have higher forb diversity, and south slopes tend to have a higher cover of nonnative plants.	*Very poor.* Various assessments suggest that the vast majority (>99%) has been fragmented and converted to arable lands, dominated by nonnative invasive plant species. Remnant patches are small and isolated, making it one of the most imperiled habitat types in the US.	*Tier 2* *Tier 3*	Giant Palouse Earthworm Short-eared Owl Common Nighthawk Grasshopper Sparrow A Miner Bee (*Andrena aculeata*) A Miner Bee (*Perdita salicis euxantha*) Yellow Bumble Bee Hunt's Bumble Bee Morrison Bumble Bee Western Bumble Bee

Target	Target description	Target viability	Nested targets (SGCN)	
				Suckley Cuckoo Bumble Bee Monarch
Depressional Wetlands	Depressional wetlands occur in depressions and old stream meander scars with closed topographic contours.	*Very Poor*. Many have be lost to agricultural conversion	*Tier 2*	Western Toad
Springs & Groundwater-Dependent Wetlands	Most wet meadows, wetlands that have a downhill drainage point.	*Very Poor*. Many have been lost to agricultural conversion.	*Tier 2* *Tier 3*	Western Toad Great Gray Owl
Riverine–Riparian Forest & Shrubland	Rivers and streams, including aquatic habitats and their associated terrestrial riparian habitats. Includes the Clearwater, Potlatch, and Palouse River systems.	*Poor*. Many have been heavily altered to accommodate anthropogenic uses including but not limited to human development and agricultural production.	*Tier 1*	Pacific Lamprey Steelhead (Snake River Basin DPS) Chinook, Fall, (Snake River ESU) Chinook, Spring/Summer, (Snake River ESU)
			Tier 2	Western Toad Nez Perce Pebblesnail A Mayfly (*Paraleptophlebia traverae*) A Mayfly (*Paraleptophlebia falcula*) A Mayfly (*Parameletus columbiae*) Cascades Needle Fly Idaho Snowfly Palouse Snowfly Straight Snowfly Umatilla Willowfly
Bat Assemblage <In progress>		*Good.* Bat populations are currently secure; however there are emerging threats of white-nose syndrome and Abandoned Mine Land closures.	*Tier 2* *Tier 3*	Silver-haired Bat Hoary Bat Townsend's Big-eared Bat Little Brown Myotis

Table 10.2 Species of Greatest Conservation Need (SGCN) and associated conservation targets in the Palouse Prairie

Taxon	Conservation targets						
	Dry Lower–Montane–Foothill Forest	Lower Montane–Foothill Grassland & Shrubland	Palouse Prairie Grasslands	Depressional Wetlands	Springs & Groundwater-Dependent Wetlands	Riverine-Riparian Forest & Shrubland	Bat Assemblage
FISH							
Pacific Lamprey[1]						X	
Steelhead (Snake River Basin DPS)[1]						X	
Chinook Salmon (Snake River fall-run ESU)[1]						X	
Chinook Salmon (Snake River spring/summer-run ESU)[1]						X	
AMPHIBIANS							
Western Toad[2]				X	X	X	
BIRDS							
Great Gray Owl[3]	X						
Short-eared Owl[3]		X	X				
Common Nighthawk[3]		X	X				
Lewis's Woodpecker[2]	X						
White-headed Woodpecker[3]	X						
Olive-sided Flycatcher[3]	X						
Grasshopper Sparrow[3]		X	X				
MAMMALS							
Townsend's Big-eared Bat[3]							X
Silver-haired Bat[2]							X
Hoary Bat[2]							X
Little Brown Myotis[3]							X
Fisher[2]	X						
SNAILS & SLUGS							
Nez Perce Pebblesnail[3]						X	
Mission Creek Oregonian[1]		X					
INSECTS							
A Mayfly (*Paraleptophlebia falcula*)[3]						X	
A Mayfly (*Paraleptophlebia traverae*)[3]						X	
A Mayfly (*Parameletus columbiae*)[3]						X	
A Miner Bee (*Andrena aculeata*)[3]		X	X				
A Miner Bee (*Perdita salicis euxantha*)[3]		X	X				

Taxon	Conservation targets						
	Dry Lower–Montane-Foothill Forest	Lower Montane–Foothill Grassland & Shrubland	Palouse Prairie Grasslands	Depressional Wetlands	Springs & Groundwater-Dependent Wetlands	Riverine-Riparian Forest & Shrubland	Bat Assemblage
Yellow Bumble Bee[3]		X	X				
Hunt's Bumble Bee[3]		X	X				
Morrison Bumble Bee[1]		X	X				
Western Bumble Bee[1]		X	X				
Suckley Cuckoo Bumble Bee[1]		X	X				
Monarch[3]		X	X				
Straight Snowfly[3]						X	
Idaho Snowfly[3]						X	
Palouse Snowfly[3]						X	
Cascades Needlefly[3]						X	
Umatilla Willowfly[3]						X	
WORMS							
Giant Palouse Earthworm[2]			X				

Target: Dry Lower Montane–Foothill Forest

The higher elevations in the Palouse Prairie Section are occupied by Dry Lower Montane–Foothill forests. These forests are currently dominated by conifer species such as Douglas-fir and grand fir. Western white pine (*Pinus monticola Douglas* ex D. Don) was historically more common, but white pine blister rust (caused by the fungal pathogen *Cronartium ribicola*), fire supression, and timber harvest have vastly reduced the distribution of this species. Ponderosa pine (Pinus ponderosa Lawson & C. Lawson) was also likely more abundant in these forests prior to fire suppression and timber harvesting. In places where canyon grasslands do not border on Palouse Prairie grasslands, they are bordered by these forests as elevation increases. Conifer forests may also adjoin Palouse Prairie grasslands on ridges surrounded by cropland and often occur as inclusions within the grasslands. The boundary of the Palouse Prairie Section is occupied by these forests as they adjoin the Bitterroot Mountains ecological section. Forest habitat in this section is predominantly privately owned, but some areas are publicly owned. A portion of these forests is managed by the Nez Perce–Clearwater National Forests, Palouse Ranger District. McCroskey State Park, managed by the Idaho Department of Parks and Recreation, contains some of this

forest type. Also the higher elevations on Craig Mountain WMA are publicly owned and managed by the Idaho Department of Fish and Game. Several corporate and private timber companies, such as Potlatch Corporation and Bennett Lumber Products, Inc., own large portions of forests in this section.

Target Viability: Dry Lower Montane–Foothill Forest

Forest management practices have dramatically altered the forests of the Palouse Prairie. The most striking change is the near disappearance of western white pine. This tree used to dominate these forests but multiple factors have contributed to its decline. White pine blister rust, fire suppression, and timber harvest have effectively eliminated western white pine from northern Idaho forests. The reduction of ponderosa pine can be attributed to timber harvest and fire suppression. These practices not only reduced western white pine and ponderosa pine but also changed the composition of the forests, making them less diverse and less stable. More specifically, timber harvest practices, such as shorter timber rotations, larger cut units, and reseeding with different species have reduced the abundance of late-seral forest, snags, and coarse woody debris; in addition, these practices have also fragmented the landscape and altered forest species composition. These changes have likely impacted at-risk species that live in this habitat type, including Great Gray Owl, Lewis's Woodpecker, Olive-sided Flycatcher, and Fisher. Condition of these forests vary dependent on past management and landownership. In general, forests that have been largely modified and fragmented by timber harvest, fire suppression, and road development are in poor to fair condition. Good-condition western redcedar (*Thuja plicata* Donn ex D. Don) groves exist but these are rare in the Palouse Prairie Section.

Prioritized Threats and Strategies for Dry Lower Montane–Foothill Forest

Very high rated threats to Dry Lower Montane–Foothill Forest in the Palouse Prairie

Decreased frequency and increased severity of wildfire

Fires throughout the West are now less frequent and more severe than historically. In dry mixed-conifer forests, decades of fire suppression have resulted in an increase in fuel loading, shift in species composition, and increase in fire severity. Many legacy stands of ponderosa pine are at risk of being lost to fire. Because of fire suppression, these stands often have an understory of Douglas-fir or lodgepole pine, which serve as ladder fuels when fire does occur, making them more severe.

Objective	Strategy	Action(s)	Target SGCNs
Reintroduce frequent, low-intensity fire to the landscape.	Reduce fuel loading and increase fuel continuity.	Use various thinning techniques and/or slashing to broaden the burn window. Use dry season prescribed fire for desired shrub response.	Great Gray Owl Lewis's Woodpecker White-headed Woodpecker Olive-sided Flycatcher Fisher

Objective	Strategy	Action(s)	Target SGCNs
Trend the landscape toward its historic natural range of variability.	Allow natural fires to burn. Use timber harvest and prescribed burns to create desired fuel conditions across larger landscapes.	Use a combination of mechanical treatments and prescribed fire to redistribute age classes.	Great Gray Owl Lewis's Woodpecker White-headed Woodpecker Olive-sided Flycatcher Fisher

High rated threats to Dry Lower Montane–Foothill Forest in the Palouse Prairie

Timber harvest management

Much of this forest type with the Palouse Prairie is managed in such a way that trends the landscape away from the natural range of varitability in terms of age structure, patch size, and species composition. These forests are fragmented by high road densities and varying land ownership and accompanying management. Many are on short rotations, and there is often little incentive to restore an appropriate species composition and to restore long-lived seral species such as western larch, ponderosa pine, and western white pine.

Objective	Strategy	Action(s)	Target SGCNs
Reestablish appropriate tree species distribution and composition.	Where appropriate, use timber harvest to target shade tolerant species. Protect legacy seral trees. Restore long lived, early seral, fire dependent tree species to the landscape	Use thinning and selective harvest techniques to restructure forest species community to historically-present species. Inventory legacy stands of seral tree species Take proactive steps to protect legacy stands from uncharacteristic wildfire. Activities may include removal of second-growth shade-tolerant subcanopy, fuel reduction, slashing, thinning, prescribed fire, etc. After timber harvest or stand-replacing fire, and on appropriate sites, restock with early long-lived seral species, e.g., western larch, ponderosa pine for noncommercial stands. Encourage appropriate re-entry interval for forest treatments.	Great Gray Owl Lewis's Woodpecker White-headed Woodpecker Olive-sided Flycatcher Fisher
Trend age class and patch size toward Natural Range of Variability.	Manage timber on a landscape level. Move forest	Use management activities (e.g., harvest and prescribed fire) to move the landscape toward its natural range of variability in terms of patch size and distribution. Consider age and patch size in adjacent stands to accomplish this at a landscape level. Identify and decommission unneeded roads.	Great Gray Owl Lewis's Woodpecker White-headed Woodpecker Olive-sided Flycatcher Fisher

Objective	Strategy	Action(s)	Target SGCNs
	fragmentation pattern toward Natural Range of Varibility.		

Noxious weeds & invasive plants

Nonnative, invasive, and noxious plants are a pervasive problem in the Palouse Prairie Section. The highly-modified nature of the landscape allows for many mechanisms of invasion. Many of the dry mixed-conifer forests in this section are threatened with invasion by spotted knapweed, cheatgrass, and ventenata. These nonnative invasive species simplify habitats, displace native species, as well as decrease forage and nesting resources.

Objective	Strategy	Action(s)	Target SGCNs
Minimize the spread of noxious weeds and invasive plants.	Inventory populations, improve record-keeping and coordination among stakeholders.	Conduct inventory efforts throughout the area. Coordinate data collection, management and analysis through local working groups. Ensure consistency in data across partners and stakeholders. Implement Early Detection and Rapid Response.	Great Gray Owl Lewis's Woodpecker White-headed Woodpecker Olive-sided Flycatcher Fisher
Restore areas dominated by invasive species.	Implement large-scale activities to remove invasive species.	Coordinate and implement integrated pest management programs that include chemical, mechanical, biological, newly registered biocides, and subsequent restoration practices (DOI 2015).	Great Gray Owl Lewis's Woodpecker White-headed Woodpecker Olive-sided Flycatcher Fisher
Increase public awareness on the effects of noxious weeds and invasive plants on wildlife habitat.	Expand education programs that highlight the importance of weed control.	Promote educational programs that highlight the damage invasive plants cause to wildlife and its habitat.	Great Gray Owl Lewis's Woodpecker White-headed Woodpecker Olive-sided Flycatcher Fisher

Road density and motorized recreation

Much of this habiat type exists within the front country where road densities are often high. Much of the area is impacted by historic road systems that are no longer needed for management, but often used for motorized recreation. Additionally, OHV use in undesignated areas can lead to degradation of forested areas. Such use can increase erosion, user conflicts, spread of invasive species, damage to cultural sites, disturbance to wildlife, and destruction of wildlife habitat. Considered an important issue on state, industrial, and private lands as well as one of USFS's "four threats" (Idaho Forest Action Plan, June 2010, Revised May 2012).

Objective	Strategy	Action(s)	Target SGCNs

Objective	Strategy	Action(s)	Target SGCNs
Minimize the effects of roads and motorized recreation on wildlife.	Ensure that wildlife values are incorporated into travel management plans. Increase effectiveness of road closures where they're in place. Reduce road density across landscape.	Participate in USFS travel management planning efforts. Continue to work with other state, federal, and private land managers on travel management issues. Work with land managers to identify and address problem areas. Recontour first 100 yards of roads to be placed in long-term storage, which prevents unauthorized motorized vehicle access. Physically decommission unneeded roads.	Fisher

Target: Lower Montane–Foothill Grassland & Shrubland

The Lower Montane–Foothill Grassland & Shrubland within the Palouse Prairie Section is characterized by a mixture of bunchgrasses and forbs with shrubs scattered throughout. This conservation target is similar to Palouse Prairie grasslands floristically. Ecologists have referred to the vegetation of this section as "canyon grasslands." The major difference between these 2 habitats can be attributed to topography and soils—canyon grasslands occur within river breaks and steep canyons and have much shallower soils than Palouse Prairie grasslands. Canyon grasslands and shrublands are also warmer and drier than Palouse Prairie grasslands. Like the Palouse Prairie grasslands, south aspects tend to be more weedy than the northerly aspects. Many of the more mesic grasslands on the cooler, northerly aspects are similar in composition to Palouse Prairie grasslands.

Large expanses of these grasslands are primarily found along the Palouse, Clearwater, and Snake rivers, but may also be found in tributary canyons. Because the canyons are too steep and soils are more shallow, little has been plowed compared to the Palouse Prairie grasslands. Much of the canyon grasslands have been grazed by sheep and cattle. Livestock grazing has contributed to nonnative weed invasions, which are widespread throughout these grasslands. Cheatgrass, yellow star-thistle, and other aggressive weeds have invaded and degraded large portions of the canyon grasslands (Gray et al 2005).

Target Viability: Lower Montane–Foothill Grassland & Shrubland

Unlike the Palouse Prairie grasslands, the majority of canyon grasslands have not been widely converted to other land uses (Weddell and Lichthardt 1998). The soils were too shallow and the slopes were too steep to plow. However the rugged terrain did not restrict extensive grazing of these grasslands. Grazing has altered much of the canyon grasslands, but there are likely some areas too steep and far from water that did not receive heavy grazing pressure (Weddell and Lichthardt 1998). These areas may be in good condition, but overall condition for this target is fair considering the intractable problem of invasive weeds. Landownership and terrain may present challenges to conserving and protecting this target as most of these grasslands are privately

owned and on steep slopes. Landowner cooperation is important to successful conservation and restoration projects. Nevertheless, even if landowners are willing, the steep canyons may be difficult and expensive to restore. The steep slopes may limit the use of machinery for site preparation and seeding and make restoration projects labor intensive. The warm and dry conditions can be problematic for planning seeding and other restoration projects.

Spotlight Species of Greatest Conservation Need: Bumble Bees

Bumble bees are vitally important pollinators of wild and domesticated flowering plants. Nationwide, native pollinators (mostly bees) are estimated to provide >3 billion dollars in free pollination services to agriculture producers (Xerces 2013a). Furthermore, native bees are superior pollinators compared to domesticated honey bees (Xerces 2013b). There are >30 species of bumble bees in the western United States, with 15 of those historically occurring in the Palouse Prairie Section (Hatten et. al 2013). Five bumble bee species have been identified as SGCN: Hunt's, Morrison, Suckley Cuckoo, Western, and Yellow Bumble Bee. These species are at risk principally because of loss of habitat and degradation, as well as rangewide declines in abundance. The Yellow Bumble Bee is the only known significant pollinator of Spalding's Catchfly, an ESA-listed threatened plant species (Tubbesing et al. 2014).

Prioritized Threats and Strategies for Lower Montane–Foothill Grassland & Shrubland

Very high rated threats to Lower Montane–Foothill Grassland & Shrubland in the Palouse Prairie

Noxious weeds & invasive plants

The invasion of nonnative and noxious plants is a pervasive threat to the canyon grasslands. Much of the grasslands, especially south-facing slopes, have been invaded by nonnative plants such as cheatgrass and yellow star-thistle. These nonnatives displace native species and degrade habitat quality. Minimizing the invasion and spread of noxious weeds and other nonnative plants within canyon grasslands is possible but can be an arduous task as the terrain is rugged and steep.

Objective	Strategy	Action(s)	Target SGCNs
Minimize the invasion and spread of nonnative, invasive, or noxious plants.	Use integrated management strategies and grazing plans.	Use chemical (fertilizers & pesticides), mechanical (mowing, disking, etc.), biological (insects, fungi, etc.), and cultural (e.g., targeted grazing, burning, crop rotations, etc.) techniques to control weeds. Restore native plant communities.	Short-eared Owl Common Nighthawk Grasshopper Sparrow A Miner Bee (*Perdita salicis euxantha*)
	Expand educational programs that highlight the importance of noxious weed control.	Promote educational programs that highlight the damage noxious weeds and invasive plants cause to wildlife and its habitat.	A Miner Bee (*Andrena aculeata*) Hunt's Bumble Bee Monarch Morrison Bumble Bee

Objective	Strategy	Action(s)	Target SGCNs
			Suckley Cuckoo Bumble Bee Western Bumble Bee Yellow Bumble Bee

High rated threats to Lower Montane–Foothill Grassland & Shrubland in the Palouse Prairie

Decreased frequency and increased severity of wildfire

As a result of fire suppression and altered fire regimes, wildfires are less frequent in the canyon grasslands. When fires are less frequent, fuels can increase and create more severe fires. Severe fires can likely result in a shift in species composition as aggressive nonnative plants, especially cheatgrass, can outcompete native species for newly available resources.

Objective	Strategy	Action(s)	Target SGCNs
Reintroduce frequent, low-intensity fire to the landscape.	Reduce fuel loading, increase fuel continuity, and reintroduce fire. Allow natural fires to burn.	Use dry season prescribed fire for desired grass, forb, and shrub response. Use natural and prescribed burns to create desired fuel conditions across larger landscapes.	Short-eared Owl Common Nighthawk Grasshopper Sparrow A Miner Bee (*Perdita salicis euxantha*) A Miner Bee (*Andrena aculeata*) Hunt's Bumble Bee Monarch Morrison Bumble Bee Suckley Cuckoo Bumble Bee Western Bumble Bee Yellow Bumble Bee
Restore native species to the landscape.	Reestablish appropriate species distribution and composition.	After fire and on appropriate sites, seed with native grass, forb, and shrub species.	Short-eared Owl Common Nighthawk Grasshopper Sparrow A Miner Bee (*Perdita salicis euxantha*) A Miner Bee (*Andrena aculeata*) Hunt's Bumble Bee Monarch

Objective	Strategy	Action(s)	Target SGCNs
			Morrison Bumble Bee Suckley Cuckoo Bumble Bee Western Bumble Bee Yellow Bumble Bee

Improper livestock grazing management

Grazing practices that result in the overuse of available forage can have many negative impacts on soil health, water quality, and wildlife habitat. Often habitat degradation, such as weed encroachment and loss of desired perennial vegetation, results in the loss of plant diversity. Changes in plant species composition (i.e., encroachment of noxious or invasive plants and loss of desirable vegetation) often results in the loss of wildlife use and the use by livestock. Adopting alternative grazing regimes through lowered stocking rates, grazing intensity, timing of grazing and size of pastures can all help decrease loss of habitat quality for wildlife and livestock.

Objective	Strategy	Action(s)	Target SGCNs
Restore plant diversity.	Use appropriate grazing techniques to restore plant diversity. Improve outreach and education to livestock producers.	Partner with landowners to develop grazing management plans that minimize negative impacts to canyon grasslands and associated wildlife. Provide information about the use of grazing management tools that increase both species diversity and forage production simultaneously.	Short-eared Owl Common Nighthawk Grasshopper Sparrow A Miner Bee (*Perdita salicis euxantha*) A Miner Bee (*Andrena aculeata*) Hunt's Bumble Bee Monarch Morrison Bumble Bee Suckley Cuckoo Bumble Bee Western Bumble Bee Yellow Bumble Bee

Species designation, inventory & monitoring

In addition to conservation actions to address specific threats, some species require inventory and monitoring to assess their current status and distribution in Idaho. As such, we identify needs for one species in the section below and identify appropriate actions.

Objective	Strategy	Action(s)	Target SGCNs
Increase our current understanding of	Determine the true distribution and rarity of	Revisit historical sites for species that have not been detected in >20 years in Idaho, to see if the species is still present.	Mission Creek Oregonian

Objective	Strategy	Action(s)	Target SGCNs
the status of terrestrial gastropods.	poorly documented terrestrial gastropods.	Where locally appropriate, expand on existing fieldwork.	

Target: Palouse Prairie Grasslands

The Palouse Prairie grasslands lie within the Lower Montane-Foothill Grassland & Shrubland system but have been identified as a separate conservation target due to differences in extent, threats, and conservation strategies required to sustain each habitat. The extent of Palouse Prairie grasslands has dramatically decreased as most have been converted to cropland. Agriculture is an important land-use activity within this area, but small and dispersed native grasslands still remain. These remnants are usually on uncultivated ridges surrounded by cropland that extends throughout the entire Palouse Prairie Section. Native grasslands are found on rolling uplands and are comprised of a mixture of perennial bunchgrasses, forbs, and low shrubs. Usually the north slopes have higher forb diversity and will have higher cover of Idaho fescue, prairie Junegrass, and native shrubs. The dominant native bunchrass on south aspects is bluebunch wheatgrass. South slopes tend to have a higher cover of nonnative plant species.

Of the remaining Palouse Prairie grasslands, many are being invaded by nonnative invasive plants. Ventenata has been documented on these grassland remnants for over a decade and is effectively displacing the native perennial bunchgrasses. In addition to ventenata, invasion by other problematic weeds such as rush skeletonweed, yellow star-thistle, and tall oatgrass are degrading wildlife habitat in Palouse Prairie grasslands. Communities dominated by nonnative species are not as favorable as intact native communities for at-risk species.

Target Viability: Palouse Prairie Grassland

By the early 1900s, much of the Palouse Prairie grasslands had been converted to agricultural uses. The rich and deep soils were excellent for growing wheat and legumes. Areas that were too rocky and steep to plow remained but have experienced major degradation by heavy livestock grazing and subsequent invasion by nonnative plant species. It is estimated that only 0.1% of these grasslands remain in a natural state (Noss et al. 1995), and they represent a high conservation priority in this section. The condition of Palouse Prairie grasslands is generally very poor since remnants are small, fragmented, located on private land, and threatened by nonnative plant species. Some good-condition remnants persist on the landscape and are in need of protection if they are to remain viable for future generations. These good-condition grassland remnants are small, but are of conservation value and the value may increase with their proximity to other remnants (Looney 2008). Many Palouse Prairie remnants are on private land surrounded by cropland and usually do not have protection from development and other land use changes that may have negative impacts. However, at some sites, it appears that cropland may serve as protection from roads and other weed corridors.

Spotlight Species of Greatest Conservation Need: Giant Palouse Earthworm

The Giant Palouse Earthworm (*Driloleirus americanus*) is an endemic species of the Inland Northwest. The distribution and ecology of the species is poorly understood, but it has been most consistently found in native Palouse Prairie grasslands and other closely related habitats. In the past 30 years, individuals have been reported from <12 locations from northern Idaho and eastern Washington. Individuals discovered in recent years were around 25 cm (10 inches) in length, far shorter than the historically reported 0.9 m (3 ft) that earned them the moniker "giant." The Idaho Department of Fish and Game, US Fish and Wildlife Service, University of Idaho, and others have partnered to develop appropriate survey protocols to address the scientific challenges associated with Giant Palouse Earthworm surveys. Preservation of Palouse Prairie grassland remnants is important to the conservation of this unique species.

Prioritized Threats and Strategies for Palouse Prairie Grassland

Very high rated threats to Palouse Prairie Grasslands in the Palouse Prairie

Off-target application of pesticides & herbicides on remnants

Intact Palouse Prairie grasslands are rare. Most of this habitat type (>99%) has been converted into arable land. The remnants of this habitat type are typically small (<2 ha; 5 acres), confined to steep or rocky sites, and privately owned. Remnants are embedded in a farming landscape where pesticides and herbicides are used to improve crop yield. When these chemicals are applied, it is common for overspray to drift onto grassland remnants; pesticides can kill native polinators and other wildlife species, and herbicides can eliminate native plant species, degrading habitat quality.

Objective	Strategy	Action(s)	Target SGCNs
Increase floral and faunal diversity on Palouse Prairie remnants.	Minimize the effects of overspray of pesticides & herbicides applied to adjacent farmlands. Promote pollinator-friendly chemicals and application methods.	Assist agricultural producers in obtaining & implementing precision agricultural technology to apply pesticides and herbicides only at targeted locations and only in amounts needed. Use GPS mapping technology to map remnants for use in precision agricultural applications. Work with Natural Resources Conservation Service (NRCS) and USDA Farm Service Agency (FSA) to limit the use of pesticides and herbicides that are shown to have a severe negative effect on diverse ecosystems by limiting available farm incentives.	A Miner Bee (*Andrena aculeata*) A Miner Bee (*Perdita salicis euxantha*) Yellow Bumble Bee Hunt's Bumble Bee Morrison Bumble Bee Western Bumble Bee Suckley Cuckoo Bumble Bee Monarch

Conversion to agriculture, residential development, and associated infrastructure

With >99% of this habitat type converted to arable lands, each remaining remnant is important. High commodity crop prices, as well as new farming equipment and techniques now make it

feasible to farm some of these sites. Furthermore, because remnants are often scenic (and therefore desirable property), they are at risk to rural development, including housing development and the associated infrastructure and roads.

Objective	Strategy	Action(s)	Target SGCNs
Preserve existing Palouse Prairie remnants.	Establish and promote restoration/protection subsidies for landowners and cooperators. Recommend that local city and county zoning rules promote the preservation of remnants.	Identify funding sources and willing landowners that are open to easements or sale. Increase the value of remnants to make it profitable to conserve them while considering the overall spatial distribution of remnants. Develop language for farmland lease covenants to protect wildlife habitat (i.e., there might be financial incentive to mitigate perceived lost income). Conduct outreach and education to work with landowners that share similar goals and values as conservation organizations. Take advantage of new landownership through partnerships developed with landowners and conservation organizations by using projects and funding sources that benefit wildlife. Ensure that conservation entities play a role in stakeholder discussions about local zoning rules.	Short-eared Owl Common Nighthawk Grasshopper Sparrow A Miner Bee (*Andrena aculeata*) A Miner Bee (*Perdita salicis euxantha*) Yellow Bumble Bee Hunt's Bumble Bee Morrison Bumble Bee Western Bumble Bee Suckley Cuckoo Bumble Bee Monarch Giant Palouse Earthworm
Preserve prairie pasture.	Minimize conversion of grazing pastures to crop fields.	Use FSA and NRCS incentive programs to maintain prairie pastures. Develop grazing plan to maintain or increase habitat diversity.	Short-eared Owl Common Nighthawk Grasshopper Sparrow A Miner Bee (*Andrena aculeata*) A Miner Bee (*Perdita salicis euxantha*) Yellow Bumble Bee Hunt's Bumble Bee Morrison Bumble Bee Western Bumble Bee Suckley Cuckoo Bumble Bee Monarch Giant Palouse Earthworm

High rated threats to Palouse Prairie Grasslands in the Palouse Prairie

Noxious weeds & invasive plants

Nonnative, invasive, and noxious plants are a pervasive problem in the Palouse Prairie Section. The highly-modified nature of the landscape allows for many mechanisms of invasion. Ironically, the arable lands matrix that Palouse Prairie remnants are embedded within can serve as a protective barrier for some remnants. Lack of access via roads and trails helps to minimize the spread of some invasive plant species. However, it does not entirely protect against invasion. Ventenata, also known as wiregrass or North Africa grass, is a particulaly problematic invasive plant species in Palouse Prairie grasslands that is displacing native species and seriously degrading habitat quality.

Objective	Strategy	Action(s)	Target SGCNs
Minimize the invasion by nonnative, invasive, or noxious plants into Palouse Prairie remnants.	Develop mechanisms for Early Detection and Rapid Response (EDRR) and reporting of suspected new plants by the general public and a formal network of amateur and professional collectors.	Partner with federal, state and NGOs to inventory current condition of remnants; revisit each on a rotating basis to monitor for invasive plant species. As necessary, spray or manually remove invasive plants.	Short-eared Owl Common Nighthawk Grasshopper Sparrow A Miner Bee (*Andrena aculeata*) A Miner Bee (*Perdita salicis euxantha*) Yellow Bumble Bee Hunt's Bumble Bee Morrison Bumble Bee Western Bumble Bee Suckley Cuckoo Bumble Bee Monarch Giant Palouse Earthworm
Maintain existing Palouse Prairie remnants and control or prevent the spread of invasive plants.	Use integrated pest management strategies. Consider Palouse Prairie remnants when making decisions about rural development.	Use chemical, mechanical, biological, and cultural techniques for maintaining native plants. Promote educational programs that highlight the damage invasive plants cause to wildlife and its habitat. Provide recommendations to local and county planning with respect to rural development decisions. Integrate wildlife and habitat into development decisions. Promote native plant species in conservation programs.	Short-eared Owl Common Nighthawk Grasshopper Sparrow A Miner Bee (*Andrena aculeata*) A Miner Bee (*Perdita salicis euxantha*) Yellow Bumble Bee Hunt's Bumble Bee Morrison Bumble Bee Western Bumble

Objective	Strategy	Action(s)	Target SGCNs
			Bee Suckley Cuckoo Bumble Bee Monarch Giant Palouse Earthworm

Target: Depressional Wetlands

Depressional wetlands within the Palouse Prairie primarily occur in topographic depressions and old meander scars. Surface water accumulates in these depressions with water sources being a combination of precipitation, groundwater discharge, lateral subsurface flow, seasonally-high water tables, overland flow from adjacent uplands, or canals or ditches. The direction of flow is normally from the surrounding uplands toward the center of the depression. These wetlands lose water through intermittent or perennial drainage from an outlet, by evapotranspiration, or infiltration to ground water. By and large, depressional wetlands on the Palouse Prairie have been drained and converted to agriculture. However, some old meander scars that retain water have become wetlands. These meander scars occur along floodplains of rivers that have migrated or have been channelized. Wetlands associated with meander scars can be found in the Hangman Creek, Palouse River, and Potlatch River drainages. Old meander scars that are usuallly disconnected from river floodplains become inundated during spring flooding events. Some ot these wetland ponds dry out seasonally while others remain wet year round. Wildlife species that roam the Palouse Prairie may seek refuge in these wetlands as they can be a reliable source of food, water, and cover. They also provide important breeding areas for amphibians, such as the Western Toad.

Target Viability: Depressional Wetlands

Depressional wetlands within the Palouse Prairie have nearly disappeared as many wetlands were drained to improve crop production. The few depressional wetlands that still exist are primarliy old meader scars along the Hangman Creek, Palouse River, and Potlatch River drainages and are usually surrounded by cropland, often hay fields. In general, depressional wetlands are in poor condition on the Palouse Prairie. When wetlands were drained and dried up, this effectively lowered the water table to a level suitable for reed canarygrass to thrive (Servheen et al. 2002). Many of these wetlands are in some stage of conversion to reed canarygrass. However, depressions that retain water into the summer months are still occupied by native aquatic-emergent plant communities.

Prioritized Threats and Strategies for Depressional Wetlands

Very high rated threats to Depressional Wetlands in the Palouse Prairie

Agricultural runoff

Modern farming practices rely on widespread use of broad spectrum herbicides, pesticides, and fertilizers to manage crop production in the Palouse. The 2000 National Water Quality Inventory, reported that agricultural nonpoint source (NPS) pollution was the leading source of water quality impacts on surveyed rivers and lakes, the second largest source of impairments to

wetlands, and a major contributor to contamination of surveyed estuaries and groundwater (EPA, 2014). Agricultural activities that cause NPS pollution include, but are not limited to, plowing too often or at the wrong time, and improper, excessive, or poorly-timed application of pesticides, irrigation water, and fertilizer (EPA, 2014).

Objective	Strategy	Action(s)	Target SGCNs
Reduce nonpoint pollutants from agricultural fields including sediment, nutrients, fungicides and pesticides.	Promote responsible timing and application of fertilizers, herbicides, and pesticides.	Promote precision agriculture to reduce total amount of chemicals applied. Educate land managers on proper timing and amounts of chemicals through Integrated Pest Management techniques specific to the Palouse. Promote agricultural practices that reduce overall possibility of sediment delivery into wetlands.	Western Toad
	Create buffers to capture agricultural runoff and leaching.	Use NRCS and FSA programs to create grassland buffers around wetlands and linked water sources. Use USDA programs to build sediment basins in areas that have captured soil erosion to contain agricultural pollution runoff to the site.	

Hydrologic alterations and habitat loss/degradation

Currently, depressional wetlands are rare due to modern day land management techniques, including drain tiling and ditching, which results in the rapid release of water storage, loss of native vegetation, and expansion of nonnative species such as reed canarygrass and meadow foxtail (*Alopecurus pratensis* L.; Servheen et al. 2002).

Objective	Strategy	Action(s)	Target SGCNs
Reduce wetland degradation.	Promote responsible grazing through fencing and rest/rotation plans.	Create riparian pasture areas that will be grazed on a 3–5 year rotation. As appropriate, use high-intensity, short-duration grazing strategies. Create buffers around remaining wetlands using voluntary programs available through NRCS and FSA programs. Aid in the development of water sources for livestock, so livestock can be excluded from wetland areas.	Western Toad
	Incentivize voluntary retirement of grazing in strategic areas.	Work with corporate timber, US Forest Service, Idaho Department of Lands, and others to identify wetland systems that would benefit from protection from grazing.	
	Implement an environmental	Educate schools, and other public forums in	

Objective	Strategy	Action(s)	Target SGCNs
	education program. Reduce the extent of pesticide, herbicide, and/or fungicide overspray.	wetland ecology, restoration, and mitigation. Provide education and outreach relating to proper pesticide, herbicide, and/or fungicide application.	
Restore and build wetlands.	Promote voluntary conservation programs.	Restore and create wetlands using voluntary programs available through NRCS and FSA programs. Remove drain tiles that drain lowland agricultural areas that were historically wetlands. Work with NRCS and FSA to create incentives to encourage increases in water holding capacity of farm fields.	Western Toad

High rated rated threats to Depressional Wetlands in the Palouse Prairie

Changes in temperature and precipitation regimes

Warmer temperatures, resulting in less snowfall in the winter and precipitation falling as rain, have a direct ramification on annual weeds. These conditions result in weeds being active in early winter, starting to germinate and grow, and effectively extending the growing season (N. Decrappeo, DOI Northwest Climate Science Center, pers. comm.) This also leads to a drier spring and summer because of reduced snowpack water storage, creating drought conditions for native plants. The overall loss of available depressional wetlands increases spring runoff flows and decreases summer flows in streams and rivers due to a loss of water infiltration in all watersheds within the Palouse.

Objective	Strategy	Action(s)	Target SGCNs
Increase capacity for water storage to combat the effects of climate change.	Promote voluntary conservation programs.	Use NRCS and FSA programs to build sediment basins and wetlands in low-gradient areas that meet land use requirements for a wetland. Work with NRCS and FSA to create incentives to encourage increases in water holding capacity of farm fields.	Western Toad

Noxious weeds & invasive plant and animal species

Due to the loss of hydrologic conditions in and around depressional wetlands, nonnative, invasive, and noxious plant species are able to colonize areas that were historically occupied by native species. Typically, native species, once excluded, are unable to gain a foothold and recover. Degraded areas have reduced habitat diversity and are of minimal value to wildlife. On the Palouse Prairie, reed canarygrass is a pervasive threat to aquatic systems.

Objective	Strategy	Action(s)	Target SGCNs

Objective	Strategy	Action(s)	Target SGCNs
Minimize the spread of invasive plant and animal species.	Improve education about invasive species, how they are spread, and what is at risk. Continue to expand monitoring and control of aquatic invasive plant and animal species.	Partner with the Idaho Department of Agriculture (ISDA) on ongoing educational programs. Expand message into new demographics (e.g., OHV enthusiasts, hunting regulations, public service announcements). Partner with ISDA on ongoing educational programs. Continue boat wash stations.	Western Toad

Improper livestock grazing management

Grazing practices that result in the overuse of available forage can have many negative impacts on soil health, water quality, and wildlife habitat. Often habitat degradation, such as weed encroachment and loss of desired perennial vegetation, results in the loss of plant diversity. Changes in plant species composition (i.e., encroachment of noxious or invasive plants and loss of desirable vegetation) often results in the loss of both wildlife and livestock use. Adopting alternative grazing regimes through lowered stocking rates, grazing intensity, timing of grazing, and size of pastures can all help to decrease the loss of habitat quality for wildlife and livestock.

Objective	Strategy	Action(s)	Target SGCNs
Maintain or restore functionality of depressional wetland areas.	Develop grazing and farm management plans; assist in identifying potential funding sources.	Work with NRCS and FSA to develop grazing management plans that minimize negative impacts (e.g., bank erosion, increased sediment loads) to wetlands.	Western Toad

Target: Springs & Groundwater-Dependent Wetlands

Springs and groundwater-dependent wetlands within the Palouse Prairie Section occur on sloping land with gradients that range from steep hillsides to nearly imperceptible slopes. Slope wetlands differ from depressional wetlands by the lack of closed contours. Seasonal seeps and wet and mesic meadows are also considered groundwater-dependent wetlands. Historically, meadows within the Palouse Prairie were often dominated by small camas (*Camassia quamash* [Pursh] Greene). These meadows and wetlands were common prior to Euro-American settlement, but most were lost when areas were drained for cropland. In these wetlands, groundwater discharges at the ground surface, often through complex subsurface flow paths (Stevens and Meretsky 2008). Groundwater sources can be from localized infiltration of surface water (e.g., precipitation, seasonal flooding). Water flow is downslope and unidirectional. Groundwater-dependent wetlands lose water primarily by subsurface outflow, surface flows, and evapotranspiration. Groundwater-dependent wetlands may develop channels, but the

channels serve only to convey water away from the groundwater-dependent wetland. These wetlands are important habitat for a variety of wildlife species and provide breeding and foraging habitat for Western Toad.

Target Viability: Springs & Groundwater-Dependent Wetlands

Groundwater-dependent wetlands are more abundant than depressional wetlands within the Palouse Prairie Section, but are still considered sparse. The camas meadows that used to dominate portions of the Palouse Prairie have largely been drained and converted to cropland. Many meadows within the Palouse Prairie are generally in poor condition. Livestock grazing has degraded these meadow communities. There are some good-condition meadows at Craig Mountain WMA. Although these meadows have historically been grazed, cattle no longer use these meadows regularly, and their condition is improving.

Prioritized Threats and Strategies for Springs & Groundwater-Dependent Wetlands

Very high rated threats to Springs & Groundwater-Dependent Wetlands in the Palouse Prairie

Agricultural runoff

Modern farming practices rely on widespread use of broad spectrum herbicides, pesticides, and fertilizers to manage crop production in the Palouse. The 2000 National Water Quality Inventory, reported that agricultural nonpoint source (NPS) pollution was the leading source of water quality impacts on surveyed rivers and lakes, the second largest source of impairments to wetlands, and a major contributor to contamination of surveyed estuaries and groundwater (EPA, 2014). Agricultural activities that cause NPS pollution include, but are not limited to, plowing too often or at the wrong time, and improper, excessive, or poorly-timed application of pesticides, irrigation water, and fertilizer (EPA, 2014).

Objective	Strategy	Action(s)	Target SGCNs
Reduce nonpoint pollutants from agricultural fields including sediment, nutrients, fungicides, and pesticides.	Promote responsible timing and application of fertilizers, herbicides, and pesticides. Create buffers to capture agricultural runoff and leaching.	Promote precision agriculture to reduce total amount of chemicals applied. Educate land managers on proper timing and amounts of chemicals through Integrated Pest Management techniques specific to the Palouse. Promote agricultural practices that reduce overall possibility of sediment delivery into wetlands. Use NRCS and FSA programs to create grassland buffers around wetlands and linked water sources. Use USDA programs to build sediment basins in areas that have captured soil erosion to contain agricultural pollution runoff to the site.	Western Toad

Hydrologic alterations and habitat loss/degradation

The seasonally moist or wet meadows are a type of palustrine, emergent wetland (Cowardin et al. 1979, Smith et al. 1995) that was once widespread in the Palouse. Euro-American missionaries and settlers dramatically altered these areas for farming purposes (Leiberg 1897; 37-38). Currently, wet meadows are rare due to modern day land management techniques, including drain tiling and ditching, which results in the rapid release of water storage, loss of native vegetation, and expansion of nonnative species such as reed canarygrass and meadow foxtail (*Alopecurus pratensis*; Servheen et al. 2002).

Objective	Strategy	Action(s)	Target SGCNs
Reduce wetland degradation.	Promote responsible grazing through fencing and rest/rotation plans.	Create riparian pasture areas that will be grazed on a 3–5 year rotation. As appropriate, use high-intensity, short-duration grazing strategies. Create buffers around remaining wetlands using voluntary programs available through NRCS and FSA programs. Aid in the development of water sources for livestock, so that livestock can be excluded from wetland areas.	Western Toad
	Incentivize voluntary retirement of grazing in strategic areas.	Work with corporate timber, US Forest Service, Idaho Department of Lands, and others to identify wetland systems that would benefit from protection from grazing.	
	Implement an environmental education program.	Conduct educational programs at schools, and other public forums in wetland ecology, restoration, and mitigation.	
	Reduce the extent of pesticide, herbicide, and/or fungicide overspray.		
Restore and build wetlands.	Promote voluntary conservation programs.	Restore and create wetlands using voluntary programs available through NRCS and FSA programs. Remove drain tiles that drain lowland agricultural areas that were historically wetlands. Work with NRCS and FSA to create incentives to encourage increases in water holding capacity of farm fields.	Western Toad

High rated threats to Springs & Groundwater-Dependent Wetlands in the Palouse Prairie

Changes in temperature and precipitation regimes

Warmer temperatures, resulting in less snowfall in the winter and precipitation falling as rain, have a direct ramification on annual weeds. These conditions result in weeds being active in early winter, starting to germinate and grow, and effectively extending the growing season (N. Decrappeo, DOI Northwest Climate Science Center, pers. comm.) This also leads to a drier spring and summer because of reduced snowpack water storage, creating drought conditions for native plants. The overall loss of spring and groundwater-dependent wetlands increases spring runoff flows and decreases summer flows in streams and rivers due to a loss of water infiltration in all watersheds within the Palouse.

Objective	Strategy	Action(s)	Target SGCNs
Increase capacity for water storage to combat the effects of climate change.	Promote voluntary conservation programs.	Use NRCS and FSA programs to build sediment basins and wetlands in low-gradient areas that meet land use requirements for a wetland. Work with NRCS and FSA to create incentives to encourage increases in water holding capacity of farm fields.	Western Toad

Noxious weeds & invasive plants

Due to the loss of hydrologic conditions in and around springs and groundwater-dependent wetlands, nonnative, invasive, and noxious plant species are able to move into areas that were historically occupied by native species. Typically, native species, once excluded, are unable to gain a foothold and recover. Degraded areas have reduced habitat diversity and are of minimal value to wildlife. On the Palouse Prairie, reed canarygrass is a pervasive threat to aquatic systems.

Objective	Strategy	Action(s)	Target SGCNs
Minimize the spread of invasive plants.	Improve education about invasive species, how they are spread, and what is at risk. Continue and expand monitoring and control of aquatic invasives.	Partner with ISDA on ongoing educational programs. Expand message into new demographics (e.g., OHV enthusiasts, hunting regulations, public service announcements). Partner with ISDA on ongoing educational programs. Continue boat wash stations.	Western Toad

Improper grazing management

Grazing practices that result in the overuse of available forage can have many negative impacts on soil health, water quality, and wildlife habitat. Often habitat degradation, such as weed encroachment and loss of desired perennial vegetation, results in the loss of plant diversity. Changes in plant species composition (i.e., encroachment of noxious or invasive plants

and loss of desirable vegetation) often results in the loss of both wildlife and livestock use. Adopting alternative grazing regimes through lowered stocking rates, grazing intensity, timing of grazing and size of pastures can all help to decrease the loss of habitat quality for wildlife and livestock.

Objective	Strategy	Action(s)	Target SGCNs
Reduce the impacts of grazing on wetland systems.	Develop grazing and farm management plans; assist in identifying potential funding sources.	Work with partnering agencies and landowners to develop grazing management plans that minimize negative impacts (e.g., bank erosion, increased sediment loads) to wetlands. Encourage the use of Best Management Practices that benefit wildlife.	Western Toad

Conifer encroachment

Meadow systems embedded within forested ecosystems are highly influenced by disturbance, or lack thereof. Fire suppression has often led to conifer encroachment into meadows, threatening the open structure, plant diversity, and other unique characteristics of these important habitats.

Objective	Strategy	Action(s)	Target SGCNs
Maintain and restore meadow systems.	Reduce conifer encroachment.	Restore historical fire regime to meadow systems. Encourage native plant establishment. Maintain open meadows through active conifer removal.	Western Toad

Target: Riverine–Riparian Forest & Shrubland

Riverine wetlands and riparian habitat within the Palouse Prairie primarily occur within river and stream channels of the Clearwater, Potlatch, and Palouse River systems. The dominant water sources in these systems are overbank flooding from the channel and subsurface shallow water table connections between the stream channel and wetlands (Brinson et al. 1995). Other water sources include overland runoff from adjacent uplands, tributary flow, and precipitation. Flow may be perennial to intermittent. In the Palouse Prairie, the riverine ecosystem is comprised of a variety of important aquatic habitat types including headwaters and small streams (1st- to 3rd-order streams) and larger rivers (4th+ order streams and rivers). Examples of small streams within the Palouse Prairie are the headwater streams of the Palouse and Potlatch rivers. These streams tend to have high gradients and water velocities where scouring and erosion exports much of the fine material in the watershed during brief snowmelt runoff periods or large thunderstorm precipitation events (i.e., flash floods). Floodplains and valley bottoms tend to be narrow. These streams can provide important spawning habitat for Steelhead. Many small streams within the Palouse Prairie have been impacted by tiling and draining of riparian areas for agricultural production. Larger rivers (4th+ order river) which include the Lower Snake and Clearwater rivers provide habitat for anadromous fish species such as Pacific Lamprey, Steelhead, and Chinook Salmon. These rivers have lower gradients and water velocities than low-order streams, and also

naturally have higher sinuosity. Originally, this geomorphology allowed for the deposition of sediment on alluvial bars and the formation of floodplains in wider valleys. However, major upstream dams on both of these rivers have reduced peak flows and prevented these rivers from forming new alluvial bars necessary for sustaining native riparian vegetation. Combined with flood control levees, these are now more stable river systems with more homogenous aquatic and riparian communities and narrowed floodplains.

Target Viability: Riverine–Riparian Forest & Shrubland

The riverine systems of the Palouse are generally in poor condition. Many have been heavily altered to accommodate anthropogenic uses including, but not limited to, human development and agricultural production. Alterations typically include straightening of tributaries in the upper watersheds to pass water and reduce flooding potential, removal of riparian buffers that would protect rivers from pollutants, and removal of in-stream complexity. These alterations typically result in heavy incision downstream, loss of stream complexity that would benefit fish species, loss of floodplain connectivity, and higher potential of pollutants mobilizing down waterways. Alterations have the potential to negatively impact both resident and anadromous fish populations that reside in the riverine systems through direct habitat loss as well as habitat degradation from decreases in water quality and quantity, and inputs from agricultural and other manmade pollutants.

Spotlight Species of Greatest Conservation Need: Anadromous Fish (Steelhead, fall-run and spring/summer-run Chinook Salmon) (cross reference Idaho Batholith Section)

Prioritized Threats and Strategies for Riverine–Riparian Forest & Shrubland

Very high rated threats to Riverine–Riparian Forest & Shrubland in the Palouse Prairie

Agricultural runoff

Modern farming practices rely on widespread use of broad spectrum herbicides, pesticides, and fertilizers to manage crop production in the Palouse. The 2000 National Water Quality

Unnamed Creek in the Palouse Prairie, stream with no riparian habitat in foreground, Palouse Prairie remnant in the background © 2015 Tiege Ulschmid

Inventory, reported that agricultural nonpoint source (NPS) pollution was the leading source of water quality impacts on surveyed rivers and lakes, the second largest source of impairments to wetlands, and a major contributor to contamination of surveyed estuaries and groundwater (EPA, 2014). Agricultural activities that cause NPS pollution include, but are not limited to, plowing too often or at the wrong time, and improper, excessive, or poorly-timed application of pesticides, irrigation water, and fertilizer (EPA, 2014).

Objective	Strategy	Action(s)	Target SGCNs
Reduce nonpoint pollutants from agricultural fields including sediment, nutrients, fungicides, and pesticides.	Promote responsible timing and application of fertilizers, herbicides, and pesticides. Create buffers to capture agricultural runoff and leaching.	Promote precision agriculture to reduce total amount of chemicals applied. Educate land managers on proper timing and amounts of chemicals through Integrated Pest Management techniques specific to the Palouse. Promote agricultural practices that reduce overall possibility of sediment delivery into wetlands. Use NRCS and FSA programs to create grassland buffers around wetlands and linked water sources. Use USDA programs to build sediment basins in areas that have captured soil erosion to contain agricultural pollution runoff to the site.	Pacific Lamprey Steelhead Chinook Salmon (both spring/summer and fall runs) Western Toad

Changes in precipitation & broad-scale hydrologic regimes

Precipitation patterns in the region appear to be shifting toward a wetter, rainfall-dominated regime in late winter and spring, possibly increasing the number and severity of rain-on-frozen-ground events. This also leads to a drier spring and summer because diminished snowpacks have limited ability to charge a watershed throughout the year. Loss of year-round groundwater recharge can result in drought conditions for native plants, which allows weeds to invade. Less groundwater recharge may decrease total available sloped and depressional wetlands available to continually charge a watershed long after precipitation stops in a given annual rain cycle. Rain on snow events and lack of holding capacity in upper watersheds increases flashiness (i.e., higher spring runoff highs, and lower summer run off lows) and decreases late season water infiltration. Less available water leads to less available habitat for fish species, as well as potentially increases the likelihood of predation and less favorable or detrimental living conditions, including dissolved oxygen, increased water temperatures, and decreased rearing habitat for certain fish species. Within areas of intense anthropogenic alterations, little native vegetation remains that would aid in streambank stability, provide root structure to improve soil-moisture holding capacity, and provide shade over adjacent streams. The excessive removal of this streamside habitat is coupled with straightening and ditching of the watershed, thereby decreasing the amount of moisture-holding capacity and increasing the flashiness of the overall watershed. This lends itself to excessive flow events that scour banks making re-establishment of new vegetation difficult.

Objective	Strategy	Action(s)	Target SGCNs

Objective	Strategy	Action(s)	Target SGCNs
Restore hydrologic function and restore riparian habitats.	Create partnerships interested in collaborative restoration. Reduce the amplitude of hydrologic flow and erosion and sedimentation rates. Raise water table for incised and channelized streams.	Strategically identify important, sensitive, and critical areas that have been damaged or destroyed. Remove drain tiles in agricultural areas. Restore native habitat on the periphery of croplands to slow snowmelt. Reconnect streams into historic channels. Restore stream meanders. Restore and replant riparian habitats along streams. Use American Beaver to accomplish hydrologic and habitat restoration. Encourage acceptance and tolerance of beavers through education and outreach. Provide tools/equipment for landowners to facilitate living with beavers (e.g., chicken wire to protect trees, information on how to minimize flooding, etc.).	Pacific Lamprey Steelhead Chinook Salmon (both spring/summer and fall runs) Western Toad

High rated threats to Riverine–Riparian Forest & Shrubland in the Palouse Prairie

Improper grazing management

Grazing practices that result in the overuse of available forage can have many negative impacts on soil health, water quality, and wildlife habitat. Often habitat degradation, such as weed encroachment and loss of desired perennial vegetation, results in the loss of plant diversity. Changes in plant species composition (i.e., encroachment of noxious or invasive plants and loss of desirable vegetation) often results in the loss of both wildlife and livestock use. Nutrient loading by livestock into riparian systems can be detrimental to resident fish and amphibian populations. Therefore, water quality can be greatly reduced by having livestock in or adjacent to riparian areas. Adopting alternative grazing regimes through lowered stocking rates, grazing intensity, timing of grazing, and size of pastures can all help to decrease loss of habitat quality for wildlife and livestock.

Objective	Strategy	Action(s)	Target SGCNs
Restore hydrologic function and restore riparian habitats.	Reduce impacts of grazing on riparian systems.	Partner with landowners to develop grazing management plans that minimize negative impacts (e.g., bank erosion, increased sediment loads) on riparian zones and stream quality.	Pacific Lamprey Steelhead Chinook Salmon (both spring/summer

Objective	Strategy	Action(s)	Target SGCNs
			and fall runs) Western Toad

Road development

The Palouse Prairie's topography lends itself to roads that are often built along creeks and up draws, the same areas that riparian and wetland habitats can be found. Develolpment of new roads often leads to habitat removal through drainage to accommodate the road.

Objective	Strategy	Action(s)	Target SGCNs
Improve water quality and preserve riparian habitat.	Minimize sedimentation and erosion due to roads.	Use proper planning and engineering techniques to ensure that adverse effects of new roads are minimized. Create partnerships to evaluate current road structure to identify where road removal or repair can improve water quality.	Pacific Lamprey Steelhead Chinook Salmon (both spring/summer and fall runs) Western Toad

Invasive aquatic, riparian, and invertebrate species

Due to the loss of hydrologic conditions in and around riparian areas, nonnative, invasive, and noxious plant species are able to colonize areas that were historically occupied by native species. Typically, native species, once excluded, are unable to gain a foothold and recover. Degraded areas have reduced habitat diversity and are of minimal value to wildlife. On the Palouse Prairie, reed canarygrass is a pervasive threat to aquatic systems. Invasive invertebrate species have the potential to seriously degrade habitat quality for wildlife and cause severe economic damage.

Objective	Strategy	Action(s)	Target SGCNs
Minimize the spread of aquatic invasive plant and invertebrate species.	Improve education about invasive species, how they are spread, and what is at risk. Continue and expand monitoring and control of aquatic invasive species.	Partner with ISDA on ongoing educational programs. Expand message into new demographics (e.g., OHV enthusiasts, hunting regulations, public service announcements). Partner with ISDA on ongoing education program. Continue boat wash stations.	Pacific Lamprey Steelhead Chinook Salmon (both spring/summer and fall runs) Western Toad

Out of basin passage issues for anadromous fish species

Dams pose challenges to upstream and downstream migration of anadromous fish species to and from their spawning and rearing areas.

Objective	Strategy	Action(s)	Target SGCNs
Provide connectivity between spawning and	Enhance fish passage.	Continue work with federal, state, and tribal organizations on current fish passage and hydrosystem management issues.	Pacific Lamprey Steelhead Chinook Salmon (both

Objective	Strategy	Action(s)	Target SGCNs
rearing habitat for anadromous fish.			spring/summer and fall runs)

Species designation, inventory & monitoring

In addition to conservation actions to address specific threats, some species require inventory and monitoring to assess their current status and distribution in Idaho. As such, we identify needs for 9 species in the section below and identify appropriate actions.

Nez Perce Pebblesnail

This newly described species was discovered as a result of recent molecular analyses (Hershler and Liu 2012). Because of its recent discovery, its distribution and ecology are poorly known. It is believed to occur in the lower portions of the Clearwater, Snake, and Salmon rivers and their associated tributaries.

3 Mayfly Species

Three species of stream-dwelling mayflies that occur in the Palouse Prairie Section have limited distributions that warrant inventory work. *Paraleptophlebia traverae* historically occurred in the Grangeville area, but has not been found since the 1930s. It is potentially extinct. *P. falcula* is known from a few observations in the headwater streams of the Palouse River around Laird Park. *Parameletus columbiae* has not been found in Idaho since 1965, it historically occurred in the Bitterroot Mountains Section as well.

Cascades Needlefly

Known from a small number of locations in Clearwater and Latah counties, Cascades Needlefly is a refugium species from the last ice age. This species is also found in Oregon and Washington and is associated with seeps and springs with cold, clean water.

Snowfly Species

Three species of stream-dwelling snowflies that occur in the Palouse Prairie Section have limited distributions that warrant inventory work. The Idaho Snowfly is know from a handful of locations in Latah County. The distribution of the Straight Snowfly also appears to be limited to a handful of locations in Latah County. Both species have not been found since the 1980s and were petitioned for listing under ESA in 2010 (Xerces Society 2010). The Palouse Snowfly is believed to have a somewhat wider distribution, occuring in southeast Washington, northeast Oregon, and north-central Idaho. It is a recently-described species that is thought to be associated with relatively pristine, gravel-based streams and rivers (Zegner and Baumann 2004).

Umatilla Willowfly

The Umatilla Willowfly occurs in Latah County in Idaho and has also been found in northeast Oregon. It is known to occur in creeks and small rivers but has rarely been reported, collected as part of invertebrate sampling efforts.

Objective	Strategy	Action(s)	Target SGCNs
Increase our current	Determine the true distribution	Revisit historical sites for species that have not been detected in >20 years in	Nez Perce Pebblesnail A Mayfly

Objective	Strategy	Action(s)	Target SGCNs
understanding of the status of poorly-documented stream invertebrates.	and rarity of poorly-documented stream invertebrates.	Idaho, to see if the species is still present. Where locally appropriate, expand existing fieldwork to include aquatic invertebrates.	(*Paraleptophlebia traverae*) A Mayfly (*Paraleptophlebia falcula*) A Mayfly (*Parameletus columbiae*) Cascades Needlefly Idaho Snowfly Palouse Snowfly Straight Snowfly Umatilla Willowfly

Target: Bat Assemblage

<In progress; cross reference bat assemblage in other section plans>

Target Viability: Bat Assemblage

Prioritized Threats and Strategies for Bat Assemblage

Palouse Prairie Section Team

An initial version of the Palouse Prairie Section project plan was completed for the 2005 Idaho State Wildlife Action Plan (formerly Comprehensive Wildlife Conservation Strategy). A small working group developed an initial draft of the Section Plan (Miradi v. 0.##), which was then reviewed by a wider group of partners and stakeholders during a 2-day workshop held at the Idaho Department of Fish and Game Panhandle Regional Office, Coeur d'Alene, Idaho in February 2015 (this input was captured in Miradi v. 0.##). Since then, we have continued to work with key internal and external stakeholders to improve upon the plan. Materials in this document are based on Miradi v. 0.##. Individuals, agencies, and organizations involved in this plan are listed in Table 10.3.

Table 10.3 Individuals, agencies, and organizations involved in developing this plan[a]

First name	Last name	Affiliation
Joel	Sauder*	Idaho Department of Fish and Game, Region 2
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Joshua	White	Idaho Department of Fish and Game, Region 4
Rita	Dixon*	Idaho Department of Fish and Game, HQ
Craig	Johnson	Bureau of Land Management
Jacie	Jensen	Farmer, Native Seed Producer
Cristy	Garris	Foundations of Success
Derrick	Reeves	Idaho Department of Land
Brett	Bowersox	Idaho Department of Fish and Game
Juanita	Lichthardt	Idaho Department of Fish and Game
Andrew	Mackey	Idaho Department of Fish and Game
Kristen	Pekas	Idaho Department of Fish and Game
Leona	Svancara	Idaho Department of Fish and Game
Terry	Gray	Independent Consultant
Clay	Hayes	Idaho Department of Fish and Game
Brenda	Erhardt	LSWCD
Trish	Heekin	LSWCD
Lynn	Rasmussen	NP Soil and Water Conservation District
Chris	Johnson	Natural Resources Conservation Service (NCRS)
Kevin	Traylor	Natural Resources Conservation Service (NRCS)
Terry	Cundy	Potlatch Forest Holdings, Inc.
Amy	Trujillo	President, Palouse Land Trust

First name	Last name	Affiliation
Skinner	Dave	Retired Plant Materials Center
Kas	Dumroese	US Forest Service, Moscow Forestry Sciences Laboratory
Juliet	Barenti	US Fish and Wildlife Service

[a] Apologies for any inadvertent omissions.
[b] An asterisk "*" denotes team leader(s) and contact point if you would like to become involved in this work.

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